A LIPID PREPARATION FOR ENHANCING MINERAL ABSORPTION

Field of the Invention

The present invention relates to the field of nutritional foods, or food supplements, aiming to provide the population with dietary ingredients that facilitate and assist the intake and absorption of minerals, in order to maintain a well balanced diet and prevent and/or treat health disorders related to the lack thereof.

Background of the Invention

All publications mentioned throughout this application are fully incorporated herein by reference, including all references cited therein.

Lipids in general are the building blocks of life. They are used as building blocks of membranes, cells and tissues, as energy sources, either immediate or stored, as precursors to a variety of other bio-molecules, as well as biochemical signals. In all biochemical processes lipids have an important role.

Many lipids, and especially triglycerides, are consumed in the human nutrition on a daily basis. In most cases, these lipids are metabolized and used for energy storage, as precursors for the biosynthesis of other lipids or bio-molecules. Whatever the fate of the lipids in the metabolic pathways, during and after their consumption, they interact with other nutrients or their metabolic products.

Fatty acids in human milk fat have a highly specific positional distribution on the glycerol backbone. This specific configuration is known to have a major contribution to the efficiency of nutrient absorption.

Palmitic acid (C16:0) is the predominant saturated fatty acid in mature human milk, constituting 20-25% of the fatty acids. 70-75% of this fatty acid is esterified at the *sn*-2 position of the triglycerides. In contrast, palmitic acid present in vegetable oils, which are most commonly used in the manufacture of infant formulas, is esterified at the *sn*-1 and *sn*-3 positions, while the *sn*-2 position is predominantly occupied by unsaturated fatty acids. The reason for the preferential esterification of palmitic acid to the *sn*-2 position of glycerol during the synthesis of triglycerides in the mammary gland in uncertain.

Several studies have demonstrated the preferential absorption of palmitic acid when present at the triglyceride *sn*-2 position [Lien EL. *et al.* (1997) *J. Ped. Gastr. Nutr.*; **52**(2):167-174; Carnielli VP. *et al.* (1995) *Am. J. Clin. Nutr.*; **61**:1037-1042; Innis SM. *et al.* (1993) *Am. J. Clin. Nutr.*; **57**:382-390; Filer L.J. *et al.* (1969) *J. Nutr.*; **99**:293-8]. The greater absorption of fat and calcium in breast-fed infants compared with those fed formula has been ascribed to two factors: the presence in breast milk of a lipolytic enzyme (the bile salt-stimulated lipase) and the relatively high proportion of palmitic acid at the *sn*-2 position of the triglyceride [Hernell O. *et al.* (1988) *Perinatal Nutrition.* New York: Academic Press.; 259-272; Wang CS. *et al.* (1983) *J. Biol. Chem.*; **258**:9197-9202]. Higher palmitic acid absorption was obtained with formulas rich in palmitic acid esterified in the *sn*-2 position of the triglycerides, than with those containing palmitic acid predominantly esterified in the *sn*-1,3 position [López-López A. *et al.* (2001) *Early Hum. Dev.*; **65**:S83-S94].

Calcium absorption

During the first year of life, an infant's birth weight triples and the length is increased by 50%. To meet the requirements of their rapidly expanding skeletal mass, growing infants require a bioavailable source of calcium. For formula-fed infants, availability of calcium depends on the composition of the formula [Ostrom KM. *et al.* (2002) *J. Am. Coll. Nutr.*; **21**(6):564-569].

The digestion of triglycerides involves lipolysis at the *sn*-1 and 3 positions and formation of free fatty acids and 2-monoglycerides. When palmitic acid is located at the *sn*-1,3 positions, as is the case in most infant formulas, it is released as free fatty acid which tends to form insoluble calcium soaps. In contrast, palmitic acid as 2-monoglyceride, as in human milk, is unavailable to form calcium soaps [Small DM. (1991) *Annu. Rev. Nutr.*; **11**:413-434.].

Several studies have shown a correlation between formulas containing high levels of palmitic acid situated at the *sn*-1,3 positions of the triglyceride and reduction in calcium absorption [Nelson SE. *et al.* (1998) *J. Amer. Coll. Nutr.*; **17**:327-332; Lucas A. *et al.* (1997) *Arch. Dis. Child.*; 77:F178-F187; Carnielli VP. *et al.* (1996) *J. Pediatr. Gastroenterol. Nutr.* **23**:553-560; Ostrom (2002) *id ibid.*; Hanna (1970) *id ibid.*]. In addition, it was shown that dietary triglycerides containing palmitic acid predominantly at the *sn*-2 position, as in human milk, have significant beneficial effects on the intestinal absorption of fat and calcium in healthy term infants as well as in preterm infants [Carnielli (1996) *id ibid.*; Carnielli (1995) *id ibid.*; Lucas (1997) *id ibid.*]. Infants fed a formula containing high levels of palmitic acid at the *sn*-1,3 positions showed greater fecal excursion of calcium and, hence, lower percentage absorption of calcium compared to infants fed a formula containing low levels of palmitic acid [Nelson SE. *et al.* (1996) *Am. J. Clin. Nutr.*; **64**:291-296.]. Fecal excretion of calcium was closely related to the fecal excretion of fat. This study also showed that urinary phosphorus excretion increased and phosphorus retention decreased when infants were fed the formula containing high levels of palmitic acid at the *sn*-1,3 positions. These findings presumably reflect lower availability of calcium for deposition in bones.

Another important issue which is associated with formula feeding is constipation in both term and preterm infants which, in the latter, can lead to life threatening complications. By contrast, constipation is rare in breast fed

term infants. A study comparing breast fed and formula fed infant stool hardness and composition showed that calcium fatty acid soaps are positively correlated to stool hardness. Stools from formula-fed infants were significantly harder than those of the breast-fed infants suggesting different handling of saturated fatty acids [Quinlan PT. *et al.* (1995) *J. Pediatr. Gastr. and Nutr.*; **20**:81-90].

In an attempt to overcome the decreased calcium absorption and hard stool phenomena, infant formula manufacturers tend to deviate from the fatty acid profile by replacing palmitic acid with lauric acid and, in some cases, by increasing the polyunsaturated fatty acid content. Studies have shown that fatty acid composition of the diet influences the fatty acid composition of developing infant tissue [Widdowson E.M. (1975) *Br. Med. J.*; **1**:633-5; Carlson SE. *et al.* (1986) *Am. J. Clin. Nutr.*; **44**:798-804; Innis SM. *et al.* (1990) Am. J. Clin. Nutr.; **5**:994-1000; Koletzko B. *et al.* (1989) *Eur. J. Pediatr.*; **148**:669-75] and thus the lipoprotein and lipid metabolism differ between breast-fed and formula-fed infants [Putnam J.C. *et al.* (1982) *Am. J. Clin. Nutr.*; **36**:106-114; Innis SM. *et al.* (1992) *Am. Coll. Nutr.*; **11**:63S-8S; Van Biervliet JP. *et al.* (1981) *Acta. Paediatr. Scand.*; **70**:851-6].

Innis and colleagues [Innis (1993) *id ibid.*], when comparing three formulas containing similar amounts of saturated fatty acids - C8-C14, C16 from palm oil (predominantly in the *sn*-1,3 positions), or C16 from synthesized triglyceride (predominantly in the *sn*-2 position) - showed that the chain length of saturated fatty acids in infant formula influences the metabolism of the dietary oleic, linoleic and alpha-linolenic acids. This study also showed that the *sn*-2 configuration of C16 in human milk triglycerides seems to have unique properties that extend beyond absorption. These include effects on HDL and cholesterol concentrations, and the cholesterol ester fatty acid composition.

The impact of soap formation on calcium absorption can be significant. Many infant formulas contain sufficient saturated fatty acids to form soaps with virtually all the calcium available.

US Patent No. 4,876,107 (corresponding to EP 0 209 327) describes a substitute milk fat composition which is suitable as replacement fat in infant formulations. In this fat composition the total palmitic acid residues present is as high as 45%, with at least half of the fatty acid residues at the 2-position of the glycerol backbone being palmitic. The product has about 27% palmitic acid residues at the 1- and 3-positions, and the other substituents at the 1- and 3-positions are mainly unsaturated C_{16} and C_{18} fatty acid moieties. The fat composition is prepared by a specific process, in the presence of hexane. Rather high levels of the fat compositions are required for the preparation of infant formulations.

EP 0 495 456 also discloses substitute milk fat compositions. These compositions have a saturated fatty acid content at the *sn*-2 position of at least 40%, most of which palmitic acid residues, and contain 0.2-7% linolenic acid moieties, 70% of which are bonded at the 1- and 3-positions of the glycerol moieties, the remaining acid moieties at the 1- and 3-positions, other than unsaturated fatty acids, are saturated C_4-C_{12} fatty acids.

US Patent No. 5,658,768 discloses a multiple-step process for preparing triglyceride compositions in which more than 40% of the saturated fatty acid moieties are at the 2-position. Many of the steps involve enzymatic modifications.

Furthermore, lipids in the form of fatty acids hydrolyzed from triglycerides interact with minerals, either obtained from the diet or present in the body, especially calcium ions. This interaction can lead, in some cases, to the complexation for example of fatty acids and calcium ions to form insoluble

complexes, which cannot be utilized by the human body and are secreted, resulting in their loss. This is actually a loss of important nutrients, since calcium is essential for skeleton building and other bodily functions, while fatty acids are an important source of energy and precursors of other lipids and nutrients.

Thus, infants and young children until the age of 3 are advised to base their nutrition on human breast milk or its replacements in the form of infant formulas, since these include in their ingredients a fat portion which mimics to some extent the fat composition of human breast milk. However, many infants and young children do not have access to such fat, either because they do not breast feed or consume infant formulas, or they consume infant formulas without human milk fat replacements, or even, above a certain age, because they supplement their nutrition with other foods, besides breast milk or infant formula. Moreover, many food products allegedly designed for the consumption of infants and young children, such as cereals, dairy products, and biscuits, are based on vegetable oils which have nothing in common with breast milk fat.

In all these scenarios, infants and young children consume fats and oils which upon their digestion create insoluble complexes with essential calcium which in turn are secreted, leading to the loss of both calcium and energy supplying lipids. This is very detrimental, since calcium is an essential nutrient during child development, in particular for skeletogenesis, i.e., bone formation.

For adults, dietary supplementation of all minerals and particularly calcium is carried out using commercial products in which the mineral can appear in different salt forms, for example calcium is in the form of calcium carbonate, calcium alginate, calcium picolinate, calcium from corals, and many other

forms. In many cases, this supplemented calcium is not absorbed by the body and is secreted, or it causes digestive problems, such as constipation.

Therefore, although the dietary supplementation of minerals is needed for infants and young children, as well as adults, especially women over the age of 45, in order to treat or prevent disorders or conditions caused by mineral depletion, it is not fulfilled in a satisfactory manner.

Thus, it is an object of the present invention to provide a dietary ingredient comprising edible lipid(s), wherein said lipid has the property of enhancing the absorption and intake of minerals. Other uses and objects of the invention will become clear as the description proceeds.

Summary of the Invention

The present invention relates to a dietary ingredient comprising at least one edible lipid, wherein said lipid does not inhibit mineral absorption, enhances mineral absorption and intake.

In particular, the lipid comprised in the dietary ingredient of the invention is selected from the group consisting of chemically or enzymatically synthesized synthetic oils, particularly glyceride-based lipids with high levels of mono- or polyunsaturated fatty acids at positions *sn*-1 and *sn*-3 of the glycerol backbone, vegetable- and plant-derived, preferably flax and canola oils, short and medium chains lipids, preferably MCT and oils mimicking the triglyceride composition of human mother's milk fat.

The dietary ingredient of the invention is preferably a mimetic of human mother's milk fat.

The said minerals are preferably selected from the group consisting of calcium, magnesium, iron and other divalent minerals.

The dietary ingredient of the invention may further comprise at least one of edible additives, emulsifiers or carriers.

The dietary ingredient of the invention is particularly intended for use in enhancing calcium absorption.

In another embodiment, the dietary ingredient of the invention may be used for the prevention and/or treatment of disorders associated with any one of depletion of bone calcium and bone density, particularly for the prevention and/or treatment of osteoporosis, for the enhancement of bone formation and bone mass maximization and for the enhancement of bone formation in infants and young children.

The dietary ingredient of the invention may also be used for enhancement of energy intake by infants and children.

In a further embodiment, the invention relates to a food article comprising the dietary ingredient of the invention.

The food article of the invention may be selected from infant formulas and food, bakery products, including bread, particularly biscuits and pastries, dairy products, including milk and dairy drinks, ice cream, cereal products, sauces, spreads, including margarine, oils and fats, soy products, meat products, fried food products, confectionery products, candy bars, candies and chocolates, snacks, drinks and shakes, instant drink products, prepared foods for infants and young children and for adults, including prepared cooked mashed vegetables and/or fruits, condiment products, cooking oils and fats and meat products.

In yet a further embodiment, the invention relates to a dietary supplement comprising the lipid ingredient of the invention, and to use of the lipid ingredient of the invention as a carrier for dietary supplements.

Detailed Description of the Invention

The present invention describes food products based on lipids mimic that replaces most or all of the fats and oils used in the preparation and formulation of these food products.

In a first aspect, the present invention provides a dietary ingredient comprising at least one edible lipid, wherein said lipid has the property of enhancing the absorption and intake of minerals.

Lipids, under the scope of this invention, include mainly, but are not limited to triglycerides and derivatives. Essentially, the invention is mainly concerned with dietary ingredient containing lipids which do not inhibit calcium absorption and promote calcium and energy intake, calcium absorption and mass bone peak maximization.

Such lipids may be based on synthetic oils (which can be produced both chemically and, preferably, enzymatically), particularly glyceride-based lipids with high levels of mono- or polyunsaturated fatty acids at positions *sn*-1 and *sn*-3 of the glycerol backbone. Lipids of interest also include certain vegetable-derived or other oils (flax oil, canola, etc.). Short and medium chains lipids, such as MCT oil can also be used, as such lipids, although saturated, do not cause the formation of insoluble calcium salts.

Also of particular interest are lipids which are oils mimicking the triglyceride composition of human breast milk fat. An example for such lipids is applicant's InFat™ [co-owned, co-pending PCT Application claiming priority

from IL158555], which has a high level of palmitic acid at the *sn*-2 position of the triglycerides, and a high level of unsaturated fatty acids at *sn* positions 1 and 3, preferably over 50%. Another example for such human milk fat mimetic lipid is the commercially available Betapol™ (Loders Croklaan).

The unique structure of InFat™ and other human milk fat mimetics results in the release of unsaturated fatty acids from the *sn*-1 and 3 positions of the fat's triglycerides during their enzymatic digestion. These fatty acids either do not generate, or generate in very small amounts, indigestible calcium complexes, hence not causing the loss of both calcium and energy. The glycerides with the palmitic acid moieties play other important roles in the nutrition of infants. Therefore, the absorption of calcium is not adversely affected, as may be with other types of fats and oils, as mentioned above.

The main property of the dietary ingredient of the invention is its ability to not inhibit and even enhance the absorption of minerals, such as calcium, magnesium, iron, and other divalent nutritional minerals. Said minerals may be provided by other foods, or it may be obtained in admixture with the dietary ingredient of the invention.

Thus, in one embodiment, the dietary ingredient of the invention may optionally further comprise divalent nutritional minerals, preferably] calcium and iron.

In another embodiment, the dietary ingredient of the invention can optionally include other nutrients, such as other minerals or vitamins, or a combination of both.

The present invention also teaches a method of preparation of the dietary ingredient of the invention, comprising admixing an edible lipid, and

optionally calcium, and at least one of additives, emulsifiers or carriers, wherein said edible lipid is a mimetic substitute of human breast milk.

The dietary ingredient of the invention shall be used in the preparation of any food product which contains fat as one of its ingredients or components. Thus, the dietary ingredient of the invention may replace some, most or all fat content of the food product.

This food product may be aimed and consumed by infants and young children, such as formulas, bakery products, dairy products, sauces, spreads, oils and fats, soy products, meat products, fried food products, milk and dairy drinks, biscuits, candy, bars, cereals, instant drink products, prepared cooked mashed vegetables and/or fruits, etc.

Alternatively, this food product is any food product, such as bakery products, confectionary products, condiments, sauces, dairy products, ice cream, biscuits, soy products, fried food products, pastry and bread, sauces, condiments, oils and fats products, spreads, soy products, meat products, margarines, cereals, drinks and shakes, infant formulas and foods, bars, snacks, candies or chocolate products. Thus, the dietary ingredient provided by the invention is to be included in food products for adult consumption.

In another aspect, the dietary ingredient of the invention is intended for use in the prevention and/or treatment of disorders associated with depletion of bone calcium or conditions related to decrease in bone density. In particular, the dietary ingredient of the invention is for use in the prevention and/or treatment of osteoporosis.

A significant percentage of the adult population, in particular pre- and post-menopause women, suffers from osteoporosis, a common disorder caused by hormonal-related depletion of calcium in the bones. Consequently, calcium

supplements are the biggest selling supplement in the world. However, as described above, in many cases these calcium supplements do not supply this essential nutrient effectively, due to poor absorption and, in some cases, they may even cause digestive disorders.

Hence, the dietary ingredient of the invention aims to solve this problem, by providing the means, i.e., the lipids that allow and facilitate calcium absorption, as described above. Consequently, the consumption of food products based on human milk fat mimetics, such as Applicant's InFat, or the other lipids of interest described above, as the major, if not only, fat source will facilitate improved absorption of calcium either from food sources, or from calcium supplements.

Additionally, the production of food products containing fats and/or oils based on the lipid comprised in the dietary ingredient of the invention shall motivate the general population to incorporate such products in their nutrition, in order to assist in the absorption and bio-availability of a variety of supplemented nutrients, particularly minerals and especially calcium. This shall enhance the absorption and bio-availability of both supplemented and naturally occurring nutrients in the normal human nutrition.

In a further aspect, the dietary ingredient of the invention is also intended for use in the enhancement of bone formation.

As mentioned before, calcium is an important nutrient during child development, especially for proper skeletogenesis. Therefore, dietary supplements containing calcium should be an integral part of children's nutrition, preferably infants and children until the age of 3. Lately, clinical data suggest that calcium supplementation is recommended also for adolescents who are at a crucial age, since at this age window, and until the age of about 25, adolescents reach the peak of their bone mass. After this

stage, the bones will start a slow and continuous biochemical process in which they start to deplete and deteriorate. It is known that the higher the bone mass built early in life, the less prone would the individual become to health disorders related to bone depletion, such as osteoporosis. Hence, it is of great health value and importance to maximize the bone mass peak. This can be achieved by balanced nutrition, and/or calcium supplementation, together with specific vitamins and other nutrients. It is a purpose of this invention to provide a dietary lipid ingredient that would ensure maximal calcium absorption and/or lack of inhibition of calcium absorption through the replacement of unhealthy oils and fats which promote the secretion of calcium, as well as other important minerals. Such oils and fats, characterized by relatively high degree of fatty acid saturation at the *sn*-1 and 3 positions are becoming more and more abundant in the diets of young children, adolescents and young people. The lipids of the invention, when consumed routinely in different food products or as dietary supplements together with mineral supplementation may increase the calcium intake and hence bone mass peak, resulting in a preventive condition to bone depletion disorders in later years of life.

The use of such lipids by the young population may also improve intake of other divalent minerals, such as iron and magnesium, the earlier important for cognitive development and function.

The enhanced absorption and bio-availability of nutrients will optimize their preservation and maximize the energy provided by the same. This enhanced absorption and bio-availability will also reduce disorders, such as digestive disorders, related to the loss of valuable nutrients.

The importance of calcium for the human body goes beyond skeletal development and the treatment or prevention of osteoporosis. Calcium is one of the most important minerals used by the organism to perform numerous

biochemical processes. It is important in ion pump functions, as a co-factor for enzymes, as a cross-membrane potential mediator, etc. Thus, calcium depletion has an adverse effect on all these processes and functions of the body. Therefore, the dietary ingredient of the invention is highly recommended as a dietary supplement in the adult diet.

When used as a dietary supplement, the lipid ingredient of the invention may be particularly suitable for supplements dispensed in an oil-based matrix. In such supplements, the lipid ingredient of the invention can assume a dual function, serving as also the oily carrier, avoiding the need for the oily matrix. Such embodiments may be suitable for many known and used dietary supplements, which are usually dispersed or carried in an oily matrix. In such cases, the oil may diminish or inhibit absorption of calcium from the normal diet.

Thus, lastly, the present invention provides a dietary ingredient for use in the enhancement of energy intake by infants and children.

The present invention is defined by the claims, the contents of which are to be read as included within the disclosure of the specification.

Disclosed and described, it is to be understood that this invention is not limited to the particular examples, process steps, and materials disclosed herein as such process steps and materials may vary somewhat. It is also to be understood that the terminology used herein is used for the purpose of describing particular embodiments only and not intended to be limiting since the scope of the present invention will be limited only by the appended claims and equivalents thereof.

It must be noted that, as used in this specification and the appended claims, the singular forms "a", "an" and "the" include plural referents unless the content clearly dictates otherwise.

Throughout this specification and the claims which follow, unless the context requires otherwise, the word "comprise", and variations such as "comprises" and "comprising", will be understood to imply the inclusion of a stated integer or step or group of integers or steps but not the exclusion of any other integer or step or group of integers or steps.

The following Examples are representative of techniques employed by the inventors in carrying out aspects of the present invention. It should be appreciated that while these techniques are exemplary of preferred embodiments for the practice of the invention, those of skill in the art, in light of the present disclosure, will recognize that numerous modifications can be made without departing from the spirit and intended scope of the invention.

Examples

In the following Examples, InFat can be replaced by any other human milk fat mimetic (e.g. Betapol^{R}), or any of the lipids of interest mentioned above.

Example 1: Infant formula based on InFat.

An infant formula comprising **InFat** and additional oils and fats that mimic the human breast milk fat composition that facilitates enhanced calcium intake as well as improved energy preservation (in the form of free fatty acids). The **InFat** may be used as is or as a blend that would constitute about 10-40% of the formula and would replace most or all other fats and oils from the formula.

As mentioned, InFat is an oil containing over 90% triglycerides. InFat also contains diglycerides. In some formulations, InFat can include up to 3% free fatty acids. The triglycerides of this product are characterized by a high percentage of palmitic acid at the *sn*-2 position, over 60%, from the total palmitic acid in this oil. The *sn*-1 and 3 positions are characterized by a high percent of oleic acid and other unsaturated fatty acids.

Example 2: Biscuits and pastry for infants and young children.

A biscuit or pastry product designed nutritionally for infants and young children. The biscuit has several percents of oils and fats, all or most are **InFat**, thus ensuring that while eating such biscuits or pastries the infant will not lose valuable calcium and energy. Such product may include 1 to 15% fat or oil, preferably 3 to 9%.

In a specific recipe, biscuits were produced from dough comprising the following ingredients: Wheat flour (41%), Cane sugar (20.5%), Water (25.8%), InFat (8.2%), Corn starch (2.9%), and Leavening agent (1.6%). Another recipe includes Wheat flour (42.2%), Cane sugar (21.1%), Water (16.8%), InFat (8.4%), Corn starch (11.0%), Leavening agent (0.3%), and Salt (0.2%).

Such biscuits would suit infants and young children in their ability to crumble when in contact with saliva in the infant's mouth and are easy for chewing and nibbling. The biscuits were produced and were tested by a tasting panel to give satisfactory results in both taste and texture.

Example 3: Dairy products for infants and children for enhanced calcium intake.

A dairy product, such as yoghurt, designed nutritionally for infants and young children. The dairy product, such as yoghurt, has several percents of oils or fats, all or most are InFat, thus ensuring that while eating such dairy product the infant will not lose valuable calcium and energy. Such product

may include 0.5 to 15% fat or oil, preferably 1.5 to 10%. The dairy product may also be enriched with calcium and iron supplements.

Example 4: Cereal products for infants and children for enhanced calcium intake.

A cereal product, such as oatmeal or rice cereal, designed nutritionally for infants and young children. The cereal product has several percents of oils or fats, all or most are InFat, thus ensuring that while eating such cereal product the infant will not lose valuable calcium and energy. Such product may include 0.5 to 15% fat or oil, preferably 2 to 7%.

Example 5: Mashed fruits and/or vegetables products for infants and children for enhanced calcium intake.

A mashed fruit or vegetable prepared food product designed nutritionally for infants and young children. The mashed fruit or vegetable prepared product has several percents of oils or fats, all or most are InFat, thus ensuring that while eating such mashed food product the infant will not lose valuable calcium and energy. Such product may include 0.5 to 15% fat or oil, preferably 1 to 7%.

Example 6: Meat products for infants and children for enhanced calcium intake.

A mashed meat or soup prepared food product designed nutritionally for infants and young children. The mashed meat or soup prepared product has several percents of oils or fats, all or most are **InFat**, thus ensuring that while eating such meat product the infant will not lose valuable calcium and energy. Such product may include 0.5 to 15% fat or oil, preferably 3 to 10%.

Example 7: Condiment products for infants and children for enhanced calcium intake.

A condiment food product, such as ketchup or mayonnaise for example, designed nutritionally for infants and young children. The condiment product, such as ketchup, has several percents of oils or fats, all or most are **InFat**, thus ensuring that while eating such condiment product the infant will not lose valuable calcium and energy. Such product may include 0.5 to 15% fat or oil, preferably 1 to 7%.

Example 8: Sweet spreads products for infants and children for enhanced calcium intake.

A sweet spread food product, such as chocolate spread, jam or peanut butter flavored spread, designed nutritionally for infants and young children. The sweet spread product has several percents of oils or fats, all or most are **InFat**, thus ensuring that while eating such sweet spread product the infant will not lose valuable calcium and energy. Such product may include 0.5 to 30% fat or oil, preferably 5 to 15%.

Example 9: Cooking oils/fats for infants and children for enhanced calcium intake.

A cooking oil or fat spread product designed nutritionally for infants and young children. The cooking oil or fat spread product has several percents of oils or fats, all or most are **InFat**, thus ensuring that while eating such oil or spread product the infant will not lose valuable calcium and energy. Such product may include 15 to 99% fat or oil, preferably 45 to 95%.

Example 10: Biscuits and pastry for adult nutrition for enhanced calcium intake.

A biscuit or pastry product designed nutritionally for adults. The biscuit has several percents of oils and fats, all or most are **InFat**, thus ensuring that

while eating such biscuits or pastries the adult will not lose valuable calcium. Such product may include 1 to 15% fat or oil, preferably 3 to 7%.

Example 11: Dairy products for adult nutrition for enhanced calcium intake.

A dairy product, such as yoghurt, designed nutritionally for adults. The dairy product, such as yoghurt, has several percents of oils or fats, all or most are **InFat**, thus ensuring that while eating such dairy product the adults will not lose valuable calcium. Such product may include 0.5 to 15% fat or oil, preferably 1 to 10%.

Example 12: Cereals products for adults for enhanced calcium intake.

A cereal product, such as corn flakes and granola, designed nutritionally for adults. The cereal product has several percents of oils or fats, all or most are **InFat**, thus ensuring that while eating such cereal product the adults will not lose valuable calcium. Such product may include 0.5 to 15% fat or oil, preferably 2 to 7%.

Example 13: Meat products for adults for enhanced calcium intake.

A meat food product, such as sausage or hamburgers, designed nutritionally for adults. The meat product has several percents of oils or fats, all or most are **InFat**, thus ensuring that while eating such meat product the adults will not lose valuable calcium. Such product may include 0.5 to 25% fat or oil, preferably 3 to 10%.

Example 14: Prepared food products for adults for enhanced calcium intake.

A prepared food product, such as hamburgers, vegetable dishes, french fries, pizza, and alike, designed nutritionally for adults. The prepared food product has several percents of oils or fats, all or most are **InFat**, thus ensuring that

while eating such prepared food product the adults will not lose valuable calcium. Such product may include 0.5 to 25% fat or oil, preferably 2 to 7%.

Example 15: Condiment products for adults for enhanced calcium intake.

A condiment food product, such as ketchup, mayonnaise, salad dressing, or mustard, designed nutritionally for adults. The condiment product, such as ketchup, has several percents of oils or fats, all or most are **InFat**, thus ensuring that while eating such condiment product the adult will not lose valuable calcium. Such product may include 0.5 to 15% fat or oil, preferably 2 to 7%.

Example 16: Cooking oils/fats for adults for enhanced calcium intake.

A cooking oil or fat spread product designed nutritionally for adults. The cooking oil or fat spread product has several percents of oils or fats, all or most are **InFat**, thus ensuring that while eating such oil or spread product the adult will not lose valuable calcium. Such product may include 15 to 100% fat or oil, preferably 25 to 95%.

Example 17: Condiment products for adults for enhanced calcium intake.

A condiment food product, such as ketchup, mayonnaise, salad dressing, or mustard, designed nutritionally for adults. The condiment product, such as ketchup, has several percents of oils or fats, all or most are **InFat**, thus ensuring that while eating such condiment product the adult will not lose valuable calcium. Such product may include 0.5 to 15% fat or oil, preferably 2 to 7%. The condiment product is also enriched with calcium, such as calcium phosphate or calcium picolinate, at levels of 0.1% to 5%, preferably 0.5% to 1.5%. The calcium supplement may provide about 500-1500 mg/serving.